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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SCHIFF HARDIN, LLP PATENT DEPARTMENT 6600 SEARS TOWER CHICAGO, IL 60606-6473			EXAMINER SUMMONS, BARBARA	
			ART UNIT	PAPER NUMBER
			2817	

DATE MAILED: 09/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/826,089	SCHMIDHAMMER ET AL.	
	Examiner	Art Unit	
	Barbara Summons	2817	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 August 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>8/19/04</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. Figures 1a and 1b should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (see e.g. page 4, the last two lines thereof). See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "DS" shown in Fig. 7A needs to be mentioned in the specification (perhaps at page 9, line 10, after "layers"?). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by

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the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "insulation disposed between..." must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 1 and 7 are objected to because of the following informalities:

In claim 1, on lines 6-7, note that "reception input" should be - - transmission input - - (see line 3).

Also, in claim 7, on line 3, "reception input" should be - - transmission input - -.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 23 and 24 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 23 recites the limitation "said stack" on line two thereof. There is insufficient antecedent basis for this limitation in the claim. Should claim 23 correctly depend from claim 22? In any art rejections that may follow, claim 23 will be considered to depend from claim 22 which provides antecedent basis for "said stack" (see line 2).

Claim 24 recites "insulation disposed between said transmission path and said reception path" which is unclear in light of the specification since no "insulation" is shown in drawings (see objection above), and because insulation is only discussed in the summary of the invention as an electrical property (see page 1, lines 8-12 and page 4, the fourth and fifth lines from the bottom) rather than a physical material that can be

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disposed. In any art rejections that may follow, the Examiner will consider the "insulation" to be simply an electrical property of the device.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 4, 5, 10-17, 19-21, 25 and 26 are rejected under 35 U.S.C. § 102(b) as being anticipated by Tikka et al. U.S. 2003/0060170 (cited by Applicants).

Regarding claims 1, 4, 5, 11 and 21, Fig. 5 of Tikka et al. discloses a duplexer 102 for separating transmitted and received signals (see e.g. section [0057]) of a defined frequency band comprising: an antenna port 120' that is asymmetrical (a.k.a. unbalanced); a reception bandpass filter 10 connected in a reception path to a symmetrical (a.k.a. balanced) reception output 110; and a transmission bandpass filter 10' that has a symmetrical balanced input is connected in a transmission path to a symmetrical/balanced transmission input 130; and wherein the bandpass filters are formed with bulk (i.e. volume) acoustic wave resonators in a lattice arrangement.

Regarding claims 12-16, 19 and 20, the phase shifter 90 can be considered "an adapter network" by its broadest interpretation; either filter 10 can be for reception with filter 10' for transmission or vice versa (see section [0049]) so that the adapter network is in either the transmission or reception path; the device is formed on a substrate integrally or with discrete chip components (see section [0056]); and the integrally formed device inherently includes at least a metallized layer on the dielectric substrate forming the acoustic resonators and the adapter network that is an adapted phase transformation transmission line (see section [0050]). Regarding claim 17, as described above, the devices can be discrete chip components (see section [0056]) and the only ways to mount and electrically connect such devices are face-up via wire bonding or face-down via bumps of some type of solder such that mounting and connection must inherently be selected from the group one of these two.

Regarding claim 10, the bandpass filters can also be surface acoustic wave devices and therefore have a surface acoustic wave "transformer" (i.e. interdigital transducer) that transforms an electric signal to surface acoustic waves or transforms surface acoustic waves to electric signals. The Examiner is basing this interpretation on the fact that Applicants' specification simply calls a surface acoustic wave device's interdigital transducer a "transformer" (see W1, W21 and W22 in Fig. 7c and page 10, first full paragraph of the specification).

Regarding claims 25 and 26, the phase shifter/advancer 90 is either in the transmission or reception path on the antenna port side since either filter can be for transmission and the other for reception as discussed above (see section [0049]).

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9. Claims 1-9, 11-13, 19, 21, 22, 25, 27 and 28 are rejected under 35 U.S.C. §§ 102(a) and 102(e) as being anticipated by Ella et al. U.S. 6,670,866.

It should be noted that, as far as the Examiner is aware, the '866 patent assigned to Nokia Corp and Infineon Tech. AG, does not have a common inventor or common assignee with the instant application that is believed to be assigned to EPCOS AG.

Regarding claims 1, 4, 5 and 21, Fig. 11 of Ella et al. discloses a duplexer comprising: an asymmetrical/unbalanced antenna port 220; a reception (RX) bandpass lattice filter 150 connected in a RX path to a symmetrical/balanced RX output 210; and a transmission (TX) bandpass lattice filter 150' that has a symmetrical input connected in a TX path to a symmetrical TX input 230. Regarding claim 2, the arrangement shown in Fig. 8 is disclosed as usable as both a RX and a TX bandpass filter in a duplexer in the same manner as Fig. 11 shows two of the filters of Fig. 9 (see col. 11, lines 36-39), such that the RX bandpass filter 120 has an asymmetrical/unbalanced output and a balun 10 connected between the RX bandpass filter 120 and the RX output 210.

Regarding claim 3, see Fig. 12 with asymmetrical transmission input 230. Regarding claim 6, see Fig. 13, with an asymmetrical output 252 from TX bandpass filter 250 and a balun 10' connected between TX filter 250 and TX input 230.

Regarding claim 7, the balun 10 in Fig. 13 can perform the function of an impedance transformer (see col. 11, lines 21-26) such that the impedance of the antenna port is different from the impedance of the RX output 210. Regarding claims 8, 9 and 22, see e.g. Fig. 16b wherein the balun 10 is the RX bandpass filter and the impedance at the input 14 and at the outputs 18/16 thereof can differ by a factor of 4

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(ibid.), and the balun filter is comprised of stacks of resonators as shown in Fig. 7.

Regarding claims 27 and 28, Fig. 11 shows a balun 10, that can also function as an impedance transformer (ibid.), preceding the RX filter 150 and an impedance transformer/balun 10' after the TX filter 150'.

Regarding claims 11 and 12, see Fig. 14 showing substrate 30 with metallized layers and bulk acoustic wave resonators. Regarding claims 13, 19 and 25, see e.g. the phase shifter 242 (in e.g. Fig. 11), which is also considered an "adapter network".

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 18, 23 and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ella et al. U.S. 6,670,866 in view of Ella U.S. 5,910,756 and 6,081,171.

Ella '866 discloses the invention as discussed above, except for explicitly disclosing a substrate material of the substrate supporting the entire device being ceramic or laminated material, or disclosing a bandpass filter using stacked bulk acoustic wave resonators and sharing a common electrode.

Ella '756 discloses a duplexer with ladder filters using stacked bulk acoustic resonators 4 (see the cover figure) that share a common middle electrode, as does Ella '171 (see the cover figure), and Ella '171 discloses a duplexer mounting substrate that is ceramic (see col. 29, lines 13-14 and 58-60 with Figs. 20a-b). Additionally, 40 dB of separation between TX and RX paths in duplexers, if not inherent, would have been known as a desirable property for the device to function adequately for practical uses.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the duplexer of Ella '866 (e.g. Fig. 12) by having replaced the normal ladder filter 150' with the ladder filter including stacked resonators sharing an electrode as taught, for example, by the cover figure of Ella '756, because such an obvious modification would have provided the benefits of improved stop band attenuation yielded by the stacked crystal filters as explicitly suggested by Ella '756 (see the abstract, especially the last three sentences).

It would also have been obvious to one of ordinary skill in the art at the time of the invention to have modified the duplexer of Ella '866, if even necessary, by having provided the device with a 40 dB insulation between TX and RX paths and to have provided the device on a ceramic support substrate, because Ella '866 is silent as to a support substrate material, thereby suggesting to one of ordinary skill that any well

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known support substrate material, such as ceramic explicitly suggested by Ella '171 (col. 29, lines 13-14) would have been usable therewith, and because 40 dB insulation would have been a known desirable TX/RX separation in the art in order for the device to function adequately in practical applications as would have been known by one of ordinary skill in the art (see also other art of record as evidence).

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ella et al. U.S. 2003/0128081 is an equivalent of U.S. 6,670,866 applied above.

Taniguchi et al. JP 6-6170 provides evidence that one of ordinary skill would have known how to provide separation between TX/RX paths in a duplexer, e.g., by providing insulation, in this case in the form of part of the package, between the paths.

Kearns U.S. 2003/0214369 discloses a duplexer with an unbalanced antenna port and balanced reception port (Fig. 5).

Takamine U.S. 2003/0169129 discloses a duplexer with an unbalanced antenna port and balanced reception port, the filters having the balun function (Figs. 21 and 24).

Hikita et al. U.S. 2002/0140520 discloses a duplexer (see Fig. 4) with an unbalanced antenna port and balanced reception port formed by a ladder filter and an LC-type balun (elements 2-5 and 9-12).

Endoh et al. U.S. 6,483,402 (see the abstract, lines 1-3) and U.S. 6,759,928 (see Figs. 1-3 and all of col. 1) each disclose a filter with different input and output impedances and that provides a balun function.

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Sawada U.S. 2001/0013815 discloses a duplexer (Fig. 26) with an unbalanced antenna port and balanced reception port with the filters providing the balun function.

Noguchi et al. U.S. 6,489,861 discloses that it is known to provide impedance matching circuits at each of the ports of a duplexer (Fig. 25).

Onishi et al. U.S. 5,892,418 discloses a filter that uses a SAW transformer (1, 2 in Fig. 1) to provide a balun function (see also Fig. 6 similar to Applicants' Fig. 7D).

Mang et al. U.S. 5,692,279 discloses a thin film bulk acoustic wave resonator filter that provides a balun function (see Figs. 8 and 9, Fig. 8 used as filter 83 in Fig. 9).

Hiroshima et al. U.S. 6,771,149 (Figs. 2B and 7-10 and col. 2, lines 26-37) and U.S. 6,535,077 (Figs. 1, 8A and B and the abstract) each disclose duplexers using ceramic dielectric filters that provide a balun function.

Williams U.S. 3,868,608 discloses that it has been known in the art for some time to use filters with a balun function (Figs. 1-2) for connection to balanced amplifiers.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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August 31, 2005



**BARBARA SUMMONS
PRIMARY EXAMINER**